

Serial No.: 09/923,974
Filed: August 7, 2001
Art Unit: 1722

Amendments to the Claims

1. (Currently Amended) An extrusion system for continuously extruding molten material to form a tubular structure having a predetermined cross-section size and uniform wall gauge concentricity, said apparatus comprising:
 - an extrusion housing having a tapered interior wall surface;
 - an extruder die head releasably connected to said housing;
 - an introduction port in said housing for introducing said molten material into the interior of said housing;
 - a fixed center die module having a frusto-conical shape configured to slidably mate with the tapered interior wall surface of said housing wherein said fixed center die module comprises a first set of channels through which molten material, distributed into said fixed center die module, is uniformly divided into two separate and equal portions and a second set of channels through which said two separate and equal portions of molten material are subsequently uniformly divided into four separate and equal portions of molten material;
 - a tubular member extending longitudinally through said fixed center die module;

and

means for securing said fixed center die module in said housing.
2. (Original) The extrusion apparatus of claim 1, wherein said housing further comprises at least one controllable temperature zone.
3. (Original) The extrusion apparatus of claim 1, wherein said housing comprises dual controllable temperature zones in the front part of the housing.
4. (Canceled)
5. (Currently Amended) The extrusion apparatus of claim 1, wherein said fixed center die module comprises a tubular member has having a uniform inner circumference along its longitudinal axis and a plurality of raised surfaces extending from and integral with the outer circumference of said tubular member, said plurality of raised surfaces exhibiting a frusto-conical configuration along said longitudinal axis and providing said first and said second set of channels a plurality of passages between said plurality of

~~raised surfaces such that said molten material is divided into equal parts during extrusion.~~

6. (Canceled)

7. (Original) The extrusion apparatus of claim 1, wherein said apparatus is a crosshead extrusion apparatus.

8. (Currently Amended) The extrusion apparatus of claim 1, wherein said tubular structure is useful in the manufacture of as a high pressure hose.

9-13. (Canceled)

14. (Original) The extrusion apparatus of claim 1, wherein the configuration of said fixed center die module precludes the need for continuous die adjustment to achieve predetermined cross-section and uniform wall gauge of said extruded tubular structure.

15. (Withdrawn) A fixed center die module for use in an extrusion apparatus wherein molten material is continuously extruded to form a tubular structure, said fixed center die module comprising a tubular member having a uniform inner circumference along its longitudinal axis and a plurality of raised surfaces extending from and integral with the outer circumference of said tubular member, said plurality of raised surface exhibiting a frusto-conical configuration along said longitudinal axis and providing a plurality of passages between said plurality of raised surfaces such that said molten material is divided into equal parts during extrusion.

16. (Withdrawn) The fixed center die module of claim 15, wherein said molten material is divided into two equal parts and the two equal parts are subsequently divided into four equal parts providing balanced flow of said molten material to an extrusion die head.

17. (Withdrawn) The fixed center die module of claim 15, wherein said module is useful in extruding a tubular structure having a predetermined cross-section size and uniform wall gauge concentricity.

18. (Withdrawn) The fixed center die module of claim 15 wherein the configuration of said module precludes the need for continuous die adjustment to achieve predetermined cross-section size and uniform wall gauge of said extruded tubular structure.

19. (Currently Amended) In an extrusion apparatus for continuously extruding molten plastic or rubber material to form a tubular structure comprising an extrusion housing and an extrusion die assembly, the improvement which comprises providing an

extrusion housing having a tapered interior wall surface and comprising employing, in the interior of said extrusion housing, a fixed center die module comprising a tubular member having a uniform inner circumference along its longitudinal axis and a plurality of raised surfaces extending from and integral with the outer circumference of said tubular member, said plurality of raised surfaces exhibiting a frusto-conical shape configured to slidably mate with said tapered interior wall surface of said extrusion housing, said plurality of raised surfaces configuration along said longitudinal axis and providing a plurality of passages between said plurality of raised surfaces such that said molten material is divided into two separate and equal parts and said the two equal parts are subsequently divided into four separate and equal parts providing balanced flow of said molten material to an extrusion die head to form a tubular structure having a predetermined cross-section and uniform wall gauge concentricity, wherein the configuration of said fixed center die module precludes the need for die adjustment to achieve said predetermined cross-section size and uniform wall gauge of said extruded tubular structure.

20. (New) The extrusion apparatus of claim 19 wherein said apparatus comprises a crosshead extruder.

21. (New) A method for manufacturing a tubular structure comprising:

continuously introducing molten material into an extrusion apparatus;

dividing said molten material, in a first divisional sequence, into two separate and equal portions;

dividing said two separate and equal portions of molten material, in a second sequence, into four separate and equal portions exhibiting a balanced flow of molten material; and

delivering said four separate and equal portions of molten material to an extrusion head through which said four separate and equal portions of molten material are extruded to form a tubular structure having a predetermined cross-section size and uniform wall gauge concentricity, said method precluding the need for die adjustment to achieve said predetermined cross-section size and uniform wall gauge concentricity.

22. (New) The method of claim 21 wherein a fixed center die module is employed to provide a molten material exhibiting a balanced flow of molten material to said extrusion head, said fixed center die module comprising a tubular member having a uniform inner circumference along its longitudinal axis and a plurality of raised surfaces extending

from and integral with an outer surface of said tubular member, said plurality of raised surfaces exhibiting a frusto-conical configuration along said longitudinal axis and providing a plurality of channels between said plurality of raised surfaces such that said molten material is divided into said two separate and equal portions in said first divisional sequence and said two separate and equal portions are subsequently divided into said four separate and equal portions of molten material in said second divisional sequence.

23. (New) The method of claim 22 wherein said tubular structure is a high pressure hose.
24. (New) The method of claim 23 wherein said high pressure hose is a power steering hose.
25. (New) The method of claim 21 further comprising the step of providing a reinforcing material around the outer surface of said tubular structure.
26. (New) The method of claim 25 wherein said reinforcing material is braided or spiral constructed fiber.
27. (New) The method of claim 26 wherein said braided or spiral constructed fiber is selected from the group consisting of glass fiber, polyester fiber, polyamide fiber and partially acetyl-formed polyvinyl alcohol fiber.
28. (New) The method of claim 21 wherein said molten material is vulcanized or unvulcanized rubber material.